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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,500	09/04/2003	Karim B. Fernandes	100765.0002US1	8371

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EXAMINER
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GOFF II, JOHN L

ART UNIT	PAPER NUMBER
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1733

DATE MAILED: 06/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/656,500

Applicant(s)

FERNANDES ET AL.

Examiner

John L. Goff

Art Unit

1733

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Drawings*

1. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because of the draftsperson objections noted on the attached PTO-948. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 1000 (Page 8, line 20), 30 (Page 9, line 22), and 2000 (Page 10, line 9). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 25 (Figure 4) and

Art Unit: 1733

26 (Figure 4). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### *Claim Objections*

4. Claims 2-13 are objected to because of the following informalities: In claim 2, line 2 after "heating the resin system" insert - - in - - for clarity. Claim 4 should depend from claim 3 not claim 2 to provide proper antecedent bases for "after the dielectric is applied and leveled". In claim 6, line 1 delete "stacked" (one occurrence). In claim 8, line 1 delete "is a solventless thermosetting resin the" and insert therein - - comprises a solventless thermosetting resin that - - for clarity because independent claim 1 requires a resin system with a thermal conductivity  $>2$  W/mK such that dependent claim 8 may only require the resin of the resin system to have a thermal conductivity in the range of 0.2-1 W/mK. In claim 10, line 1 after "wherein" insert - - the - -. In claim 11, line 1 delete "resins" and insert therein - - resin - -. In claim 13, line 2 delete "achieves" and insert therein - - achieve - -. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: the particular method steps for forming a multilayer circuit board. The claim does not require any method steps such as coating a prepreg with a solventless hot-melt resin system, heating the coated prepreg to form a B-stage prepreg, stacking the B-stage prepreg in a multilayer circuit board lamination layup, and laminating the layup to form the multilayer circuit board.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

Art Unit: 1733

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-11 and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura et al. (U.S. Patent 5,633,042) in view of Boyko et al. (EP 375980) and optionally Schuft (U.S. Patent 5,141,050).

Nakamura et al. disclose a method of forming a B-stage, solventless hot-melt resin system coated prepreg. Nakamura et al. teach the method comprises providing a solventless hot-melt resin system comprising thermosetting resin (e.g. epoxy), curing agents, and accelerators, providing a continuous prepreg, heating the resin system, pumping the resin system to a manifold having a slot-die under a controlled pump speed, moving the prepreg at a controlled line speed under the slot-die, extruding the resin system through the slot die onto the prepreg, moving the coated prepreg through heated compaction rolls, heating the coated prepreg by passing the coated prepreg under an IR source or hot air source, moving the coated prepreg through additional heated compaction rolls, and heating the coated prepreg by passing the coated prepreg under an additional IR source or hot air source to form a B-stage prepreg (Figures 1 and 2 and Column 1, lines 6-14 and Column 4, lines 36-67 and Column 5, lines 1-40 and Column 6, lines 41-67 and Column 7, lines 1-40 and Example 1). Nakamura et al. do not specifically disclose the thermal conductivity of the resin system. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use as the resin system taught by Nakamura et al. one having high thermal conductivity (e.g.  $>2$  W/mK) by including in the resin system conductive filler particles as was well known in the art as shown for example by Boyko et al. to increase the thermal conductance of the prepreg. Regarding the particular amount of filler (e.g.

Art Unit: 1733

to obtain a thermal conductivity  $>2$  W/mK), it would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine/optimize the amount of conductive filler in the resin system taught by Nakamura et al. as modified by Boyko et al. as a function of the thermal conductance of the resulting prepreg as doing so would have required nothing more than ordinary skill and routine experimentation.

Regarding claims 6 and 9, Nakamura et al. do not specifically teach stacking the B-stage prepregs into a lamination layup, it being noted Nakamura et al. teach the B-stage prepregs are used to form electrical products. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the B-stage prepregs taught by Nakamura et al. stacked into a lamination layup to form for example a circuit board after fully curing the resin of the prepreg as it was well known and conventional in the art to use B-stage prepregs in this manner as shown for example by Boyko et al.

Regarding claim 8, Nakamura et al. teach the solventless hot-melt resin system comprises epoxy resin a resin known to have a thermal conductivity in the range of 0.2-1 W/mK as evidenced by the optional reference to Schuft.

Boyko et al. disclose a resin system coated prepreg wherein the resin system comprises epoxy resin, curing agents, accelerators, and conductive fillers. Boyko et al. teach the conductive fillers increase the thermal conductivity of the resin system resulting in increased thermal conductance of the prepreg. Boyko et al. teach that after the coated prepreg are B-staged the B-stage prepregs are stacked into lamination layups and laminated to form circuit boards, circuit cards etc. (Page 1, lines 1-2, 33-37, and 45-51 and Page 5, lines 48-51 and Page 6, lines 18-31).

Schuft is evidence that epoxy (alone with no filler) has a thermal conductivity of about 0.2 W/mK (Column 1, lines 35-36).

10. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura et al., Boyko et al., and optionally Schuft as applied to claims 1-11 and 13-16 above, and further in view of Tait et al. (EP 476752).

Nakamura et al., Boyko et al., and optionally Schuft as applied above teach all of the limitations in claim 12 except for a teaching of using cyanate ester or polyimide as the thermosetting resin in the solventless resin system, it being noted Nakamura et al. are not limited to any particular resin. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use as the resin in the solventless resin system taught by Nakamura et al. as modified by Boyko et al. and optionally Schuft well known resins used in solventless resin systems such as cyanate ester or polyimide as shown for example by Tait et al. as only the expected results would be achieved.

Tait et al. disclose a method of forming a solventless hot-melt resin system coated prepreg. Tait et al. teach the method comprises providing a solventless hot-melt resin system comprising thermosetting resin (e.g. epoxy, cyanate ester, polyimide, etc.), curing agents, and accelerators, providing a continuous prepreg, heating the resin system, pumping the resin system to an applicator roll under a controlled pump speed, moving the prepreg at a controlled line speed under the applicator roll, applying the resin system to the prepreg, and heating the coated prepreg by passing the coated prepreg under an IR source or hot air source to a form B-stage prepreg. Tait et al. further teach that B-stage prepreps are stacked into lamination layups and



Art Unit: 1733

laminated to form circuit boards. (Figures 1 and 3 and Page 1, lines 1-7 and Page 4, lines 44-54 and Page 5, lines 10-30 and Page 6, lines 24-27 and Page 7, lines 20-21 and 42-43).

***Conclusion***


11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John L. Goff** whose telephone number is **(571) 272-1216**. The examiner can normally be reached on M-F (7:15 AM - 3:45 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Blaine Copenheaver can be reached on (571) 272-1156. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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